# BOTANICAL OBSERVATIONS IN SOUTHERN UTAH. II.

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On the 8th of May an opportunity offered of making an excursion in a southwestern direction to the Beaver-dam Mountains, about twenty miles from St. George. This range forms a high dividing ridge extending in a southeast course, separating the valleys of the Santa Clara and Muddy Rivers, which are the principal northeastern tributaries to the Rio Virgen. Through this mountain mass, composed of variously inclined sedimentary rocks made up of alternate strata of sandstone, limestone, and variegated marls, with immense beds of gypsum, the main stream of the Virgen cleaves its way by an impassable cañon. Our route after crossing the Santa Clara near its mouth, then flooded with melted snow and turbid from the dissolved mud of its lower alluvial banks, followed up one of the "dry washes," as they are significantly termed, leading more directly towards the mountain slope. Along the course of this sandy bed, the "desert flowering willow" (*Chilopsis linearis*) was abundant, though not yet fully leaved out, nor offering any display of its showy Catalpa-like blossoms. Still more conspicuous at this season of the year was the *Cowania Mexicana*, then completely covered with a profusion of pure white flowers, almost hiding from view its finely divided varnished leaves. A pleasant balsamic fragrance, exhaled in the clear atmosphere from this charming shrub, lent additional attractions which seemed to be appreciated by a swarm of hovering insects. The adjoining uplands were composed of various colored clay and sandy knolls, often fantastically washed, and intersected by miniature ravines and deep basins. The vegetation on these slopes was mainly composed of the prevalent Chenopodiaceæ, occasionally set off by the more graceful forms of Larrea, Algarobia, or the showy *Dalea Johnsoni*. Amid the more usual forms of undergrowth, made familiar in my rambles near St. George, my attention was drawn at a single locality to a showy Papaveraceous plant, with nodding white flowers, in which I was delighted to recognize the *Arctomecon Californicum* Torr. (No. 6), collected only by Fremont thirty years ago, and figured and described in his report from a

single specimen. The present collection, since supplemented by mature fruiting specimens, furnishes the means of completing the description of this interesting plant, which seems to differ from the original figure in its less hairy leaves, four (not six) valved capsule and more cæspitose habit. The fruiting specimens show marcescent petals, persisting after the maturity of the seed, and an eversion of the upper third of the triangular valves, leaving the placental ribs connected at the summit with the united stigmas and forming a basket in which the shining black seeds lie loosely like so many eggs. The plant is apparently biennial, with deep tap roots, the broken stem and leaves giving out a yellowish sap. In the two localities where found it grew in a loose marly soil, strongly impregnated with gypsum.

On reaching a higher elevation on a continuous upward grade there was brought to view a greater profusion of plants and shrubbery, conspicuous among which may be noted *Audibertia incana*, *Coleogyne ramosissima*, and a cæspitose yellow-flowered Mamillaria (*M. chlorantha* Engel., ined.). At our nooning place, having reached an elevation of not less than one thousand feet above the valley of the Virgen, a deep gorge in the limestone rocks afforded a scant supply of water. In the abrupt face of these perpendicular rocks, a delicate fern was noticed, which Prof. Eaton has determined to be identical with the *Notholœna tenera* Gillies, from the South American Andes, not before found in North America. Owing to the shortness of our stay and the difficulty of securing specimens from the inaccessible positions in which they grew, only scanty collections were made, but the locality is so readily identified that some future botanist will be able to supply the demand for this interesting addition to North American Filices. Other plants afforded by this locality were the diminutive *Œnothera pterosperma* Watson (No. 70), *Astragalus arrectus* (No. 45), a tall Phacelia of a climbing habit with foliage resembling *P. tanacetifolia*, but apparently distinct, *Phacelia ramosissima* Benth. (No. 184) and a robust showy form of *Eriogonum ovalifolium* Nutt. (No. 241).

Farther on in our upward ascent, we reach a growth of clumpy cedars, being the common species of this country, extending from Lake Utah to Arizona. This is the *Juniperus tetragona*, var. *osteosperma* Torr., since determined by Dr. Engelmann to be a variety (*Utahensis* ined.) of the western species, *Juniperus Californica*.

It is readily distinguished from the more common *Juniperus occidentalis* Hook., with which it is probably associated farther south, by its larger green mealy-coated fruit, one-seeded, with a hard stony shell, the mature fruit fading chocolate-brown, not purple, etc. With this tree at all high elevations the common "Piñon" (*Pinus edulis* Engel.) is quite constantly associated. The undergrowth here exhibits less of a desert feature in the presence of such plants as *Streptanthus cordatus* Nutt. (No. 10), *Pentstemon puniceus*, var. (No. 152), *Phlox canescens* Torr. & Gray (No. 186), *Eritrichium leucophæum* DC. (No. 166). Quite a conspicuous feature in the floral landscape was presented by dense clumps of *Berberis Fremontii* Torr. (No. 5), then in full flower, its bright yellow racemes contrasting prettily with its stiff spiny holly-like leaves.

Near the close of the day in ascending the last sloping ridge, leading down on the opposite side to the wide desert plain through which the Muddy courses to unite with the Virgen, we first recognized one of the principal objects of our journey in the singular forms of that remarkable desert production, *Yucca brevifolia* Engel. This is universally known among the Mormon settlers under the name of "*The Joshua.*" The mail rider over these desert tracts had furnished us weekly reports of its progress in flowering, so that we were constantly on the lookout for a first view of what had never yet been examined by a scientific botanist. At first a few scattering clumps of the peculiar stiff spiny leaves that characterize this genus of plants attracted attention, then some gaunt forms raised on withered trunks revealed the identical species. On hastening forward to a more vigorous growth, where the masses of compact flowers were visible at a distance crowning the top of the upper branches or main axis, we soon had one of the lower flowering stems ruthlessly torn down for a closer inspection. The first feeling was one of disappointment; the flowers, crowded in a close pyramidal head, failed to exhibit the ordinary graceful forms pertaining to the Liliaceæ. The perianth was of a dull greenish-white color, its divisions long-linear, thickened and confusedly massed together, while the odor given out was decidedly fœtid, seeming to present special attractions only to various beetles and insect larvæ. An examination of the inflorescence shows a regularity such as the botanist would expect: the upper leaves of the flowering branch gradually becoming bract-form subtend in their axils small jointed flower-stems, with the lower flowers generally

arranged in threes. These in continuing their spiral arrangement on the main axis form the condensed mass of flowers which, opening from below upwards, prolong the flowering process for several weeks. Only a few of the flowering stems perfect fruit, and occasionally (as during the present season) all prove abortive, possibly owing to the absence of some insect agency for effecting fertilization. In the desert districts lower down, where this species especially flourishes, the flowering heads are said to weigh frequently over fifty pounds.

The material and notes now supplied will, it is hoped, enable Dr. Engelmann who has made a special study of this genus, to complete the technical description of this remarkable species.

A short ramble on the following morning in the vicinity of our camp brought to view some other points of botanical interest. Quite common on loose gravelly slopes occurred the neat species of Ranunculus, *R. Andersonii*, Gray (No. 2). This differs from the figure and description in Watson's Bot. King's Exp., in its constant branching habit, rendering this variety better suited for horticultural purposes. Its marcescent petals seem to retain to some extent their bright color and streaks after the maturity of the achenia.

Here also were found the singular Rutaceous shrub, *Glossopetalon spinescens* Gray (No. 27), and *Spiræa Millefolium* Torr., which closely simulates *Chamæbatia foliolosa* Benth. Along the edges of dry ravines *Astragalus eriocarpus* Watson (No. 44) was quite frequent, usually associated with *Eritrichium leucophæum* DC. (No. 166) and the handsome *Pentstemon puniceus* Gray (No. 152). On the summit of a high limestone ridge overlooking the valley of the Muddy, was seen for the first time the dwarf species of Agave, *A. Utahensis* Engel. This species, which adheres quite closely to crevices in the limestone rocks, forms extensive patches by sending out offsets, so that in cultivation it could be readily propagated, making an interesting addition to the class of hardy pot plants. At the time of our visit it was just sending up its flowering stalks, too early, however, for securing herbarium specimens, which had been supplied in the collections of Dr. Palmer four years previous, from which the original description was drawn.

The hasty return trip to St. George, loaded down with Yuccas, Cacti, and Agaves, did not afford much opportunity for excursive botanizing.

With the advent of prolonged summer heat the Eriogoneæ became especially prevalent both in variety of species and number of individual forms. Thus with the exception of Nemacaulis and Lastarriæa (the latter probably lately introduced into California from Chili), we have representatives of all the North American genera of the tribe. Of these, Eriogonum includes eleven species, Chorizanthe two, Oxytheca, Centrostegia and Pterostegia, one each. Of the slender annual species of Eriogonum some are remarkably gregarious in their mode of growth, forming dense patches that give a singular aspect to the bare landscape. This is particularly marked in *E. reniforme* Torr. (No. 237) and *E. trichopodum* Torr. (No. 240). More irregularly scattered over rocky slopes occurs the singular fistulous-stemmed species *Eriogonum inflatum* Torr. (No. 230); this from the peculiar bulging appearance of its main stalk and upper branches, sometimes fully one inch in diameter, has received the fanciful popular name of "bottle stoppers." Early in the season the young and tender shoots afford an agreeable sub-acid juice not unwelcome to the thirsty traveller over these arid tracts, in lack of more attractive cheer suggested by the above popular name. Later in the season *E. Parryi* Gray, n. sp. (No. 239), with its broad cordate leaves and divaricately branching flower stem, is commonly met with on rocky slopes, being usually associated with *Chorizanthe brevicornu* Torr. (No. 230) and *Chorizanthe rigida* Torr. (No. 231). On dry sandstone rocks, *Eriogonum racemosum* Nutt. (No. 234) is conspicuous, and in favorable localities there is an abundance of the singular *Oxytheca perfoliata* Torr. & Gray (No. 228) and *Centrostegia Thurberi* Gray (No 232).

Not infrequent in the shade of overhanging rocks adjoining the Virgen is a very neat species of Symphoricarpus recently described by Professor Gray under the name of *S. longiflorus* (No. 87). This shrub forming dense clumpy masses, with slender branches, small foliage, and delicate white flowers streaked with pink, would make an interesting addition to this class of common cultivated shrubs; unfortunately the flowering season was too late to secure mature fruit to determine its scientific characters or make it available for garden cultivation. Quite constantly associated with the above is a slender-leaved suffruticose Arenaria, *A. Fendleri*, var. *glabrescens* Watson (No. 20), which from its peculiar habit and mode of growth it is difficult to regard as a mere variety of that widely spread subalpine species.

Among the rarities of this section must be noted a well marked new species of the peculiar southwestern genus Petalonyx, characterized by Prof. Gray as *P. Parryi* n. sp. (No. 75), this making a second recent addition to the genus. Of this only a single plant was met with, forming a low bush with remains of dead stalks, especially conspicuous at a distance from the faded leaves of the previous season's growth, exhibiting a pure pearly white. The delicate cream-colored blossoms, with exserted style and stamens, reminded one of Lonicera, but the polypetalous flowers and the peculiar hairy brittle leaves designated it at once as belonging to the Loasaceæ. A diligent search over the dry gravelly and alkaline soil, where it was found associated with the common "grease woods" of this region, failed to bring to light any other plants, so that this single locality, precariously situated within a stone's throw of the great Mormon temple, does not encourage the hope of a prolonged existence for the benefit of future botanists.

Another interesting plant of this same family was also met with in crevices of denuded sandstone rocks near the Santa Clara. This I recognized at once as an old acquaintance, having several years previously collected imperfect specimens of the same, past flowering, on the Lower Colorado. Of this, provisionally named in a manuscript list *Eucnide urens* Parry, full material has now been collected, from which Prof. Gray has recently published a description in the Proceedings of the American Academy, Vol. x, pp. 71–72, under the name *Mentzelia* (*Eucnide*) *urens*, n. sp. (No. 79).

Another plant especially worthy of notice belongs to the natural order *Asclepiadaceæ*. It is a small twining milk-weed, growing in loose drifting sand, in which the thick tap roots are deeply buried; these send up several slender stems, which cling to the scanty shrubbery or lie prostrate on the scorching sand, where blown about by the wind they form irregular and constantly changing circles. The small umbels of flowers in the axils of the upper leaves are of a dull yellow color and are without the usual horny appendages. Dr. Engelmann, to whom specimens have been sent, has characterized it in the accompanying list under the name of *Astephanus Utahensis*, n. sp. (No. 209).

A frequent associate of this latter plant is the little known *Dicoria canescens* Gray, an annual composite plant allied to Franseria. In similar dry sandy soil was also found *Franseria eriocentra* Gray, forming an irregularly branched bushy shrub two to three feet in height.

With the disappearance of the ordinary class of desert annuals, the early summer rains bring forward a peculiar set of composite plants, remarkable for their strong odor, due to a large development of oil-bearing glands. These include two species of Psathyrotes, viz., *P. annua* Gray (No. 114) and *P. ramosissima* Gray (No. 115). Besides these is a plant not seen by me, probably a Pectis, which spreads over the ground in prostrate mats, its foliage so strongly charged with an aromatic oil that it is extracted by a rough process of distilling for domestic use, the plant receiving the popular name of "head-ache weed." Later in the season my attention was mainly taken up in the collection of seeds. This though generally tedious and uninteresting, especially when requiring exposure to the hot mid-day sun, yet offered not a few points of peculiar attraction. It was instructive in passing over these arid tracts to note the provision made for scattering or preserving these necessary products for the succeeding season's growth. Thus the evanescent annuals drop their seeds in the loose sandy or gravelly soil or rock crevices, in the most suitable conditions for retaining their vitality during the hot dry season, while the withered stems, having fulfilled their part in the processes of growth and reproduction, dry up and are blown away. Deep sun-cracks in the strongly impregnated gypseous soil receive the seed of the future crop of annual Œnotheras, Gilias, Phacelias and Eriogonums, to be covered up by the first rains. The species of Compositæ, not so generally here as elsewhere provided with a feathery pappus for transporting their seeds, maintain their foothold by unusual productiveness. Even in the case of *Glyptopleura setulosa* Gray, which seems amply furnished with a light capillary pappus, it is rare to find the aigrette expanded, and the matured achenia remain enclosed in the involucre, thus leaving them to be planted in the loose soil with the dried-up remains of the parent stem. Another instructive example is presented by *Tetradymia spinosa* H. & A., in which the seeds are wholly covered with a white woolly down, and at the season of maturity are thickly scattered over the arid tracts in which it grows, gathered by the wind like snow drifts, into every sheltered nook, or clinging to the adhesive hairs of branching Mentzelias.

Bulbous plants, such as Androstephium and Calochortus, hide their newly formed bulbs in the gravelly soil at depths practically inaccessible to all but curious botanists or hungry Indians. A

singular arrangement for shooting seeds was brought to my attention in the case of *Gilia setosissima* Gray. Wishing to collect somewhat largely of the seeds of this neat little annual, I watched more closely than usual the maturity of the capsules. In most of the other species of this prevalent genus, there is a succession of flowers and maturing capsules, which latter opening at the summit discharge their seeds while the plant is still producing flowers, thus rendering it difficult to secure a large quantity of seed without including capsules not sufficiently mature. But in the case of *Gilia setosissima*, all the capsules remain tightly closed till the whole plant becomes dry and brittle. In then gathering seed by picking each plant separately, I noticed the seed projected with some force against my hand. On closer examination I found that these capsules open from below upwards, and that the tension accumulated by the shrinking of the tissues in the process of drying gives an elastic spring to the three separating valves when released from their attachment at the base of the calyx, that throws the contained seed from two to six feet. After making this discovery it was interesting to watch the process by loosening the attachment of the valves with the point of a knife, and see how far they would shoot. The majority of the seeds were scattered within a radius of two feet, while in the plumper capsules the shots took effect to a distance of six feet or more. The three separated valves of the capsules on account of their light chaffy texture were not thrown as far as the seeds.

A similar character, though less marked, was also exhibited in certain species of cæspitose Phlox, though in this latter case the explosions observed occurred some time after the capsules were detached from the calyx. The conclusion arrived at is that the character of explosive capsules in this particular family is peculiar to those that open at the base instead of the summit.

In the succeeding paper I shall conclude this account of botanical observations in Southern Utah by a notice of a short excursion to the alpine district of Pine Mountain, and a more prolonged stay in the vicinity of Cedar City, including a visit to the elevated sheep pasture in the adjoining mountain range,—to be followed by an appendix containing a full list of the plants collected, with descriptions of the new or imperfectly known species.